JPRS 75404

31 March 1980

East Europe Report

SCIENTIFIC AFFAIRS

No. 667

FBIS FOREIGN BROADCAST INFORMATION SERVICE

JPRS 75404

31 March 1980

EAST EUROPE REPORT

SCIENTIFIC AFFAIRS

No. 667

CONTENTS | PAGE

 [III - EE - 65]

CONTENTS (Continued)

Page

BULGARIA

NEW CHEMICAL PRODUCTS DEVELOPED

Sofia TEKHNICHESKO DELO in Bulgarian 9 Feb 80 p 3

[Article by Dicho Dichev, okrug correspondent from Dimitrovgrad: "New Chemical Products"]

[Text] In recent years, the collective of the Institute for Light Chemical Production in Dimitrovgrad has developed a large number of production methods and projects for new products to be produced at the chemical combine in Dimitrovgrad. A number of them will lead to the utilization of industrial waste products and to the complete processing of raw materials. The installation which has been built for producing dimethyl sulfate utilizes the ether [or ester] gases which are a waste product from methanol production. A new chemical product has actually been developed which is much more profitable than methanol itself. Soon the installation will be intensified, and its capacity will be increased by nearly 3-fold.

On the basis of gaseous sulfur, the first installation has gone into production for a fungicide "Thiozol-80" after which the first shop has been built for this chemical. In comparison with ground sulfur, Thiozol possesses significantly higher consumer qualities and is more profitable. And by the thorough processing of sulfuric acid, a new installation has been developed and gone into operation producing 65-percent oleum, and the importing of this from abroad can be stopped. With the opening up of an installation producing nitrous oxide, imports of this chemical will also be halted and an important problem for domestic medicine will be successfully solved.

Several major developments by the institute's specialists have been introduced. A shop has been put into operation producing nitrobenzene and aniline, and this creates the possibility of complete refining of the Kremikovtsi benzene and the diluted nitric acid and hydrogen-containing gases from the Dimitrovgrad chemical combine. A qualitatively new product has been obtained and this will find good acceptance on the international market.

For the first time in the socialist countries, specialists from the institute have developed an original method for producing Formalin with a low methanol content using oxide catalysts. The shop built for this method

has been in operation for 3 years already, and its product has significantly higher technical, economic and quality indicators than the old shop. By the complete processing of Formalin, production of pentaerythrite has been developed, and this satisfies the nation's needs for manufacturing lacquer coverings.

These examples eloquently affirm the great advantages when intellectualization is turned into the guiding principle of a collective of creative scientific workers. Production quality is significantly increased, product volume rises, and the fulfillment of the foreign exchange plan is increased.

During the years of the Eighth Five-Year Plan, the production of mineral fertilizers will be reconstructed and modernized at the Dimitrovgrad chemical combine, chiefly using Soviet designs. During this period, specialists from the institute will focus their efforts on creating new or improved industrial products with higher consumer qualities. The aim is for the product to have high efficiency, in order to be sold freely on world markets, with production being achieved by a minimum amount of capital investments. The potassium nitrate and formic acid installations will go into operation this year, production of carbamide [urea] paste will be intensified, and the pentaerythrite installation will be improved in order to reach its designed capacity.

The Dimitrovgrad chemical combine will gain significant benefits in the construction of double-product installations, such as the capacity for dimethyl aniline and aniline. Depending upon the market conditions, an opportunity is created to produce either product over a certain period of time, or the two chemicals simultaneously. The output of potassium nitrate and sodium nitrate has also been improved, and these also can be alternated or produced together.

During the Eighth Five-Year Plan, the Dimitrovgrad chemical combine will create capacity for producing the new chemical polyethylene oxide which will be used in producing building materials. It is planned that the polyethylene oxide will be produced at facilities of the Khimik [Chemist] factory which is a division of the Dimitrovgrad combine.

Phosphogypsum and pyrite slags are waste products which are accumulating annually, and this means that we must take steps to create capacity for their processing and use. This may require the purchasing of a license from abroad.

In its product introduction activities, the institute's collective is counting on help from the Khimremont [Chemical Repair] organization which possesses one of the largest divisions on the territory of the chemical combine.

The designated new chemical products have been developed by specialists from the institute who have significant experience in order to decisively continue their previous path. Intellectualization is being established as the guiding principle for the future activities of all the institute's specialists and leaders.

10272
CSO: 2202

BULGARIAN-MADE SPACE INSTRUMENTS DESCRIBED

Sofia TEKHNICHESKO DELO in Bulgarian 9 Feb 80 pp 1, 6

[Article by Senior Science Associate Stefan Chapkunov, scientific secretary of the TsLKI of the BAN: "Bulgarian Space Instrument Building"]

[Text] Bulgaria began to work actively in preparing space experiments with its own scientific facilities in 1969, when the Central Space Research Laboratory (TsLKI) was set up under the BAN [Bulgarian Academy of Sciences].

The then director of the academy Academician Lyubomir Krustanov, along with the Corresponding Member, Prof Kiril Serafimov, promoted the idea of creating our own specialized instrument building unit. Its task was to begin the then uncustomary job for our nation of developing Bulgarian scientific instruments for directly carrying out space experiments under the Interkosmos Program. This group was headed by Engr Stefan Chapkunov, senior science associate and candidate of physical sciences.

In close collaboration with the laboratory which was part of the Space Research Institute in Moscow under the leadership of Prof Konstantin Gringauz, the small and young instrument building collective of the TsLKI in a record time created a combined electronic unit for conducting fundamental ionospheric research from an earth satellite. This device which was called the P-1 flew on the Interkosmos-8 satellite which was launched on 1 December 1972. By the fact of the flawless operation of the first Bulgarian instrument, the P-1, for measuring the electron concentrations and temperatures, Bulgaria became the 18th space power in the world.

From 1972 to 1977, scientific space instrument building in Bulgaria developed intensely, and as a result numerous satellite and rocket experiments were conducted under the Interkosmos Program (IL-12, IL-19, the heavy geophysical rockets of the Vertikal series), as well as under a national program (the Centaur-II-48 and Centaur-II-50 meteorological rockets, a joint Bulgarian-Indian scientific experiment).

On the basis of the already rich experience in space instrument building, the laboratory began to develop a basic and extensive scientific program

which was carried out by the first Bulgarian cosmonaut who was training for a flight.

The BCP Central Committee and the Council of Ministers have set for the National Space Research Committee and chiefly for the TsLKI the responsible task of designing and manufacturing in an unprecedentedly short time an unique Bulgarian instrument with which the cosmonaut-pilot Maj Georgi Ivanov would make measurements in near space on board the Salyut-6 orbital station.

As is known, the first Bulgarian set of scientific devices burned up in the instrument compartment of the Soyuz-33 ship which due to damage to the main engine was unable to dock with the Salyut-6 station. Nevertheless, but still the second flight sets reached their position and the entire scientific program was carried out with an additional strain on the crew of Salyut-6, cosmonauts Lyakhov and Ryumin. Two months ago, the official Bulgarian delegation at the Interkosmos Council for Space Research and Use in Moscow received cassettes with recordings of the Bulgarian scientific experiments, capsules from the technological experiments and the thanks of the Soviet community for the high scientific and applied value of the Bulgarian program.

Since 1972, the TsLKI has been carrying out specific research on the natural atmospheric optical emissions. The base observatory in Stara Zagora with its director, senior science associate Mitko Gogoshev, has been a pioneer in this research on a national scale.

Instruments of the type of the EMO-R2, the EMO-1 and others have flown and proven their qualities. These have served as the basis for developing the Duga [rainbow] optical system to be used specifically for research from a manned orbital station of the Salyut type. At the annual COSPAR session in Innsbruck in 1978, the Soviet cosmonauts Romanenko and Grechko reported on one of their discoveries which seemed strange to the scientists. During the 96-day flight, the two cosmonauts had observed light areas at an altitude of 200-500 km above the geomagnetic equator. In a talk between Corresponding Member Kiril Serafimov, Senior Science Associate Mitko Gogoshev, the two cosmonauts and the director of the Space Research Institute of the USSR Academy of Sciences, Academician Roald Sagdeyev, in one night a new original scientific task was formulated, namely to study these equatorial arcs using Bulgarian electrophotometric equipment. Thus was born the idea of developing the Duga equipment.

There followed months of around-the-clock intense work in the laboratory, at the plants and institutes. A special cosmonaut trainer was worked out and manufactured separately, and this left for startown [?possibly Zvezdograd, the Soviet space center] 3 months prior to the flight of the first Bulgarian cosmonaut.

Briefly the Duga device has the following units:

1) An optico-mechanical unit which is used to receive, focus and record the incoming light energy on the entrance of the telescope system;

2) A recording system which amplifies, shapes and records the light energy which has been converted into an electrical signal.

Duga is an original design and its qualities are described by the restrained but precise estimates of the Soviet state commission which accepted the Bulgarian equipment: "The preliminary acceptance testing showed that the Duga equipment has been developed considering the newest achievements in the area of scientific instrument building. In terms of basic specifications (sensitivity and spatial separation), the equipment surpasses the best models of analogous equipment used in space research, it is unique, and makes it possible to obtain new scientific data on the physics of phenomena in the earth's ionosphere and magnetosphere."

Regardless of the fact that certain particular questions of remote aero- and space methods of studying the earth have long been worked on in Bulgaria, they have gained their complete and thorough development in the last several years. Over this time, under the TsLKI of the BAN, a special problem group was set up for applying and effectively using remote methods for the purposes of ecology and the national economy.

Our scientific research and designing activities in this area have developed in two directions: the elaboration of the methods and means for using aerospace data, and the designing of metering equipment.

To ensure the uniform identification of different natural formations recorded as photo and TV images received by aerospace equipment, instruments were developed for measuring the spectral and reflective characteristics. The ISOKh-010 and ISOKh-020 instruments are, respectively, the second and third modifications of an instrument series which provide consecutive metering of spectral and reflective characteristics. The high indicators of this series have been achieved due to the use of a semiconductor photoconverter which operates under charge storage conditions (an original Bulgarian invention). Instruments of the ISOKh type have been used during the comprehensive aircraft, ground and satellite experiments not only over Bulgarian territory, but also in the USSR, the CSSR, Poland and Mongolia. Since 1976, an analogous device has been in use over the ranges of Cuba. On the basis of this equipment, the Spektur-15 instrument was developed, and this has been successfully used on board Salyut-6. It employs the most recent achievements of modern light engineering and electronics. The photoelectronic converter has been replaced by a light-converting rule made up from 15 phototransistors which accumulate the electrical charges.

The Spektur-15 device consists of two units: Spektur-15K and Spektur-15KR. The first of them is a 15-channel spectrometer operating in a range of 490-950 nanometers. With the appropriate lens, the solar radiation reflected from the studied earth's surface or from a space object (or the

intrinsic radiation of the studied body) is sent to a diffraction grating after which the spectral components forming it are obtained. The Bulgarian diffraction grating is an invention developed at the Central Laboratory for the Optical Recording of Information under the BAN. After the diffraction grating the signals fall on the front surface of the semiconductor converter which is made up of 15 phototransistors and which converts the light energy into electrical energy. Each phototransistor converts the light only of a precisely defined band of the studied spectral range. The obtained energy is sent consecutively in time to the electronic scanning device for further processing.

The Spektur-15KR unit is a device for recording on magnetic tape in a digital form the data received from the multichannel spectrometer, and simultaneously controls the operation of the entire device.

The metering of the electrical energy corresponding to each spectral channel is carried out using an analog-to-digital converter. The obtained values are recorded on a special digital cassette recorder at a high recording speed. A complicated electronic device controls the work of the cassette recorder and synchronizes the functioning of all the remaining equipment. In addition to the digital data from the spectral measurements, there is also the possibility of recording both on tape and in a digital form the voice information with which the researcher-cosmonaut accompanies the carrying out of the given research. The recording time of one cassette is fully sufficient for studying a strip of earth surface 350 m wide and over 3,000 km long. The recorded cassettes are returned to earth with the cosmonaut and are then processed by computer.

The basic measurements of the Spektur-15 equipment are made when the lens of the spectrometer is turned toward the center of the earth. For this purpose the appropriately oriented satellite window is used, with the spectrometer mounted on a special stand. This stand makes it possible to turn the spectrometer a certain angle in relation to the initial direction, and this is necessary in some of the experiments.

In designing the Spektur-15 equipment, consideration was given to all the necessary specific requirements of a space flight: small geometric dimensions, low weight, resistance to acceleration and vibrating, low energy consumption, reliable operation under conditions of weightlessness, and so forth. The data obtained from the equipment can be used comprehensively for the purposes of science and the national economy, both independently and together with data recorded by the MKF-6 camera.

At the present moment, the TsLKI is carrying out the major scientific project, Bulgaria-1300, and this will establish the name of our scientific organization as the leading one in research on near space.

10272
CSO: 2202

PLANS TO START INDUSTRIAL PRODUCTION OF ALGAE NOTED

Sofia TEKHNICHESKO DELO in Bulgarian 16 Feb 80 p 6

[Article by Petrana Dizkova: "Algae Production"]

[Text] From the verbatim record:

Dr Khristo Dilov: "...One kilogram of algae introduced into microbiological nutrient media in terms of effectiveness replaces 18 kg of first-quality beef.

"That is the figure, Academician Bratanov. There is no mistake."

(An amused stirring.)

Academician Kiril Bratanov: "Hence from 1.5 decare of algae production, more meat will be obtained than from a cattle farm?"

Dr Khristo Dilov: "...In essence, that is the case. If you like I will give some other data: One decare of wheat annually provides as much yield as one decare of algae produces in 8 days...."

The "amused stirring" verged on a sensation. Even among our scientific circles. This was caused in 1979 by Doctor of Biological Sciences Khristo Dilov, director of the Scientific Production Laboratory for Algology under the BAN [Bulgarian Academy of Sciences] in his report "The Cultivating of Microalgae and Their Use."

A scientific conference was underway at the Unified Center for Biology of the BAN on the subject "Biology in the Service of Life" called by the July party demands and by a basic strategic goal of biologization as a necessary guarantee for our future development.

In essence, in recent years in the mass information media more and more often provocative titles have begun to appear of the type: "Will Mankind Feed Off Algae in the Future?"

It was all very intriguing but perplexing. Mankind was attempting to penetrate this forecast of the scientists. Would this be actually a food, or would the algae help our food?

At that time the experiments were making headway.

But let us take up the microalgae. Prior to 1970, they were only experimental, but over the last 5-6 years, their production has reached an industrial scale. In 1972, 250 tons of dry algae biomass were produced in the world, and just several years later, this production had increased by 16-fold and was approaching 5,000 tons annually. The basic producers are the Japanese firms using the species Chlorella (in Taiwan, Okinawa, Singapore and elsewhere). The second large producer is Mexico using the blue-green alga Spirulina. In the FRG, the group of Prof Süder has developed a number of joint programs for algae production (in India, Thailand, Peru and elsewhere). The Soviet Union and the United States do not produce a dry algae biomass, but rather suspensions for the needs of livestock raising. One of the most effective and widest applications of algae as a biostimulant has been developed in the USSR. The yield from this suspension in the diet of [illegible] and calves increases their weight increase during fattening. The great effectiveness of using algae in silk raising and poultry raising has been shown. Soviet and Japanese sources have announced data on its use in fish raising. The Soviet Union holds a leading place in the use of algae for purifying waste water. Very successful results have been noted in the USSR in the area of medicine.

Are we aware of the opportunities offered us?

There are 1[illegible],[illegible]00 species of algae, 520 of which are green algae. It has been estimated that they provide more than one-half of the world's oxygen balance. Their enormous advantage is that opportunities are created for obtaining organic matter from inorganic sources. Scientists expect that by the end of the century with the help of algae, photosynthesis, that phenomenal natural process, will be turned into an industrial one. In comparison with the higher plants, algae possess certain advantages: simple development and a short life cycle. In algae, the efficiency of light is from 4 to 6 percent with mass culturing under field conditions in comparison with 1 percent for the higher plants. They contain 60 percent protein, [illegible] percent carbohydrates, 15 percent lipids, and 6 percent minerals. More important is the great diversity of their vitamins, terpenes, amines, [illegible], vegetable hormones, phenols and so forth. The microalgae contain over 350 components.

One bean plant consumes 200 liters of water per year. Around 80,000 cubic liters of water are required to produce 1 ton of protein from beans, while 1 ton of protein from the algae requires 35-fold less water.

[illegible] Rupite

In the pretty Struma Valley, under Mount Kozhukh near Petrich is Rupite ([illegible]). Microalgae in Bulgaria began their residence here, as

the production facilities of the Algology Laboratory are responsible for their mass cultivation. From the 3 decares which the facilities possessed last year, a biomass was produced for experiments in Bulgaria and for exports abroad. This tiny "plant" with modern installations and equipment in the future will be enlarged, as interest in Bulgarian production is high. Our algae "have set out on a journey" through the trade fairs at Hanover, Nürnberg, Minsk, Skopje and Zagreb.... Foreigners are asking for kilograms of specimens, and are seeking production methods.

Thus, the facilities at Kupite will be enlarged. And semiproduction facilities will be built near the Traycho Kostov TETs in Sofia and near the pig farm in Blagoevgrad. But when? Dr Dilov did not provide precise dates to our question, and the ones planned have long since passed.... In truth, what has been planned is not small. And if thousands of obstacles of an "objective" nature do not appear, Bulgaria can certainly soon begin new industrial production. But on the other hand there must be more energetic help from the ministries of power and chemical industry, the State Committee for Science and Technical Progress and the Okrug People's Council in Blagoevgrad. Because the Algology Laboratory is developing an unusual area of science and practice for our country, and this is an area which has been little worked out in the world. And because the people working in it are responding rapidly to the tasks, they are endeavoring to improve the organization of work, and are devoting highly skilled labor and their dedication. But not everything depends just on them.

Protein of the Future--Expensive or Inexpensive?

Algae produce protein from waste water. But do they not become toxic, and do they not accumulate heavy metals from the water? Does not the meat from poultry fed on algae become dangerous for people? Numerous experiments have repudiated the fears. The heavy metals do not accumulate in the broiler meat, but rather pass through the digestive tract and are eliminated.

In the burning of natural gas by thermal power plants, an enormous amount of gas is released with a high temperature and containing carbon dioxide. These gases are not used and they pollute the atmosphere. A year of experiments with the stack gases from the Traycho Kostov TETs has shown the usability of carbon dioxide by the algae for obtaining a biomass for animals. Plans are being drawn up to build an experimental facility near the plant for cultivating algae on an area of up to 2 decares.

The Algology Laboratory has worked out a program for culturing algae in the waste waters of the pig complex in Blagoevgrad. Experiments with suitable strains show that the algae eliminate 80 percent of the nitrogen, 70 percent of the phosphorus, and greatly reduce the most important harmful indicators.

With the help of the laboratory, an installation has been built for Chlorella production near the pig complex in the town of Isperikh. The piglets fed on the suspension have shown a weight increase of 14-18 percent.

[illegible] leva of profit have been obtained for each lev invested into the algae. Having become personally aware of the results, Comrade Todor Zhivkov recommended that the experiment be improved and introduced into other sectors. At present Burgas, Plovdiv, Pleven and Turgovishte okrugs are demanding this. The laboratory will work out a standard model for an installation for livestock raising, and will study the possibilities of bicarbonate feeding of the algae, as this will facilitate and reduce the cost of cultivation. Experiments with undernourished piglets in Asenovgrad, [illegible] Kubrat and elsewhere using Czechoslovakian methods have established that the algae preparations are tolerated well, in 15 days the piglets come out of the state of hypotrophy, and put on live weight. The economic effect is actually great.

Our associations with the silkworm are linked to the mulberry leaf. But what about the winter? The Japanese have effectively used algae for feeding the silkworms. Why not try this in our country? This idea of the laboratory's also awaits implementation. The appropriate economic organization must be concerned with it, and together with the laboratory work out the methods for the year-round raising of silkworms with the incorporating of algae in their artificial food....

[illegible] research and practical results show that microalgae (by the [illegible] zooplankton) can also be used in fish raising.

In medicine....

Even a tablet form has been worked out for a powdered dried biomass of Chlorella and Scenedesmus, and this has shown a therapeutic effect on model stomach ulcers. Under a joint program between the laboratory and the Farmakhim [Pharmaceutical Chemical] DSO [State Economic Trust], this year integrated research was started on the use of algae products in human medicine. And together with the Bulgarian rose combine in Kazanluk, algae are to be widely introduced into the perfume industry and medicinal cosmetics.

The entire range of problems of the laboratory has been included in the subparts of the CEMA plan. Cooperation has been established with institutes in the USSR, CSSR, Poland and other countries.

The successes of the collective at the Algology Laboratory are neither easy nor rapid. Its future path also will not be easy. It is a path of new searches, a path along which the scientific results will pick up speed toward practical application. Probably we will become more aware that microalgae are not only a healthy food, but also a food of the future, and we will be treated by algotherapy. We will breathe cleaner air and will have pure water. All with the help of these beneficial, strange, little, inexpensive, therapeutic, purifying microplants, the algae.

And Bulgaria is one of the first nations in the world to have its own new industry.

[illegible]

BULGARIA

DEVELOPING PHOTO MATERIALS FOR MICROELECTRONICS

Sofia OTECHESTVO in Bulgarian No 4, 26 Feb 80 p 17

[Article by Vasil Simeonov: "The TsLAFOP Phenomenon"]

[Text] At present there are few people who are not involved in one way or another with photography. One has merely to leaf through the family albums or recall the faded films in the home laboratory. Certainly no one would take it upon himself to assert that photography is just an interesting hobby. Art critics say flattering things about it. Conferences and congresses are organized on photographic science. Photographic technology and techniques are pointed to as a convincing example of dynamic industrial development.

Some 140 years have passed since the first daguerreotypes, and enormous progress has been made, thousands of new patents and ideas have been registered, while lasting achievements have been made not only among the amateur and professional photographers, but also in science, equipment and techniques. It would take a great deal of time and space to write a word of praise about photography. One has merely to mention such representative "consumers" as electronics, computers, medicine, biology, optics, and so forth.

For the moment let us leave the interesting world of the artistic or master photographers, and attempt to get behind the striking black-and-white or colored landscape of the photos. We must admit that if we are interested in the nature of the photographic process or in the mysterious mechanism which creates the image on the photo paper or film, we will find both miraculous discoveries as well as many mysteries. We shall be gratified by the steady progress of a rather unusual type of photography which is called silver-free.

Why is this interesting? In order to answer this question in detail, we must "unravel" the ball of mysteries around the photographic process. The task is not an easy one if we are not familiar with the "language" of solid-state physics and chemistry. Let us recall all that we know from the small leaflets which come with each film or each box of photographic paper. What is a photo emulsion? A thin layer of gelatin in which are located small crystals of light-sensitive silver bromide. Note--a silver compound. And all forecasts, both optimistic and pessimistic, note that mankind can count on a

sufficient supply of this precious metal for a very short period of time. Thus the first question arises--can we replace the silver bromide with another light-sensitive compound?

For a long time silver salts have been the undisputed favorites in photography. Many other substances are light sensitive, but for photography mainly silver bromide is used and to a smaller degree silver chloride or silver iodide. The reason for this lies in their ability to "keep separate" for an extended time the products of the light attack. The other compounds which are not "indifferent" to light do not have such strong "brakes" and they allow the products to rebond and to erase the effect of the light. It is impossible to develop or enlarge the initial light effect. All the painstaking research has led to outright pessimism on the possibilities of developing another type of stable photographic systems which would function as simply and rapidly as the silver ones.

Certainly, silver-free systems have been developed, and some of them have won enviable popularity (for example, xerography). But the silver-free systems were clumsy and complicated, and in addition to light they required an electric field, heat, special conditions and materials. At the same time electronics was placing demands on photography. This field required photo materials with great sensitivity, fine resolution and great contrasty. Where could and should one find a solution to this second, but no less important question?

About 13 years ago several essentially new lines were added to the scheme which satisfactorily described the process in the photosensitive silver salts. Their author was the Bulgarian scientist Yordan Malinovski. To get at the heart of the achievement, again special terms are needed, but the most important point is: this addition to the theory of the photo process immediately opened up the way to resolving the difficulties. The discovery of Y. Malinovski was a small challenge to the photographic tradition which had been created. At the same time it seemed that other light sensitive compounds could be employed for the needs of photography. There was talk of new photographic systems which were not an emulsion of gelatin and silver bromide, but rather thin, vacuum-evaporated layers of silver bromide, lead iodide, lead bromide, thallium compounds and arseno sulfides. The advantages of the new materials were theoretically obvious for electronics, as on them much finer details had to be recorded, while their resolution had to be scores and even hundreds of times better that that of the emulsion films. Consequently that way was opened to silver-free systems and to photo materials for microelectronics.

A scientific discovery immediately became fused with important requirements of everyday practice. Let it now be stated that conventional photography has not kept up with these practical requirements, and at present it is not protected against the "competition" of the silver-free systems. But what about microelectronics?

Let us speed up a bit. At present Yordan Malinovski is a corresponding member of the Bulgarian Academy of Sciences, a professor, doctor of chemical sciences, winner of the Dimitrov Prize, and honorary member of the Royal Photographic Society; he participates on the editorial boards of respected scientific journals. Is this great or little recognition for a contribution to the theory of the photographic process?

Before giving an unqualified answer to this question, we must go back together some 10 years. At that time, a decade ago, there was only the theory or the expectation of silver-free photographic systems. Now there is the Central Laboratory for Photo Processes [TsLAFOP] of the Bulgarian Academy of Sciences, a very specific academy unit. Here you will not find cozy offices and traditional laboratories. Here you will see vacuum installations, original assembly lines, pilot installations for semi-industrial experiments, magnificently equipped, clean rooms which are usually a priority for semiconductor plants.

Most of the foreign guests of the academy without fail "pass through" the laboratory, and often the comments are as follows: "You have done all of this without any preliminary experience? And everyone is working on the same problem? Then there is no need to worry about the results!" Just a polite guest or diplomacy? But there are other criteria, the estimate of the "aces" in the area of photographic science during the International Symposium on Model Research on the Photo Process, as well as the international photographic science congresses in Dresden and Rochester (the headquarters of the famous Kodak firm), an estimate which has the obliging name of the "TsLAFOP [the initials of the laboratory] phenomenon."

A further criterion is the patents for various silver-free photographic systems of Bulgarian origin which have been issued in the FRG, Italy, England, Belgium, France and the United States.

Prof Malinovski is hard to find in his office of the laboratory director. He is the driving force, the point of support. For this reason it is not strange that the successes of the laboratory are always linked with his name. Today, 10 years after his achievement, with the recognition of the community and the interest of the entire world involved in photographic processes, it is still difficult to put Prof Malinovski in one of the classifications of the historians of science. He is a theoretician, and proof of this is his contribution to the study of the essence of the photographic process. He is an experimentor, as on experiments he built his theoretical concepts, the only things he believes in. He is an organizer. You will agree that there are few people who risk taking the path full of unknowns, a path to something which no one has done before you.

Prof Malinovski is fond of saying that science is not a calling placed on us. Scientific activities are not love at first sight. It comes in time, it is made by it, with the successes and with the failures. Then the new and the unknown are not a risk, but the duty of the scientist.

At present the laboratory is developing evaporated layers of silver bromide and silver-free compounds which are photo materials for the needs of microelectronics, flexible printed chips for the "memories" of electronic computers, materials for lithographic purposes, and for new, model research of the photographic process. The work is crucial, and demands great effort both by the scientific workers and by the leader himself. The activities of Prof Malinovski are again a challenge to traditions. He likes to be involved in each experiment, to discuss each idea, and to be simultaneously in many places. And he does not wait to be found in his office, he does not keep visiting hours, and is not fond of interviews or official activities. Thus, if we want to help the historians of sciences who like to classify persons such as him in their books, we would propose a new category, a dynamic scientist.

There is no time for us to discuss the future of photography. That is not our task. But all the activities of TsLAFOP and its leader, Prof Yordan Malinovski, show that there are difficulties in science and that the way out of them can be controlled by people.

10272
CSO: 2202

CALF WITH ARTIFICIAL HEART STILL ALIVE AFTER TWO MONTHS

Prague PRACE in Czech 8 Feb 80 p 5

[Interview with Professor Jaromir Vasku and surgeon Jan Cerny, J. E. Purkyne University School of Medicine in Brno; by M. Nadovicova]

[Text] The main building of the School of Medicine at J. E. Purkyne University in Brno appears practically deserted in the early evening in February. The medical students have already left, and few lights are on. Only the windows of the Department of Pathological Physiology are bright. Here the scientific center of the KUNZ [Kraj Institute of Public Health] is solving, already for the 14th year, the research task "Support and Replacement of the Heart With an Artificial Heart." A great scientific experience awaits us beyond a few doors. In an experimental room a test calf, Hasan, is living already his third month with a Czechoslovak artificial heart and a Czechoslovak drive and control unit that Engr P. Hanzelka and Engr J. Vasku designed, and P. Svoboda built, in close cooperation with the doctors of the Department of Pathological Physiology.

Hasan, already the 50th in the series of test calves, is evidently pleased with life, even though his heart is made of polymethyl methacrylate and plexiglas. He was frisky even immediately after implantation. Two hours later, he stood up, drank water and began to show interest in food, which in itself is the best sign of the operation's favorable prognosis. He is fed hay and granulated feed (although he does prefer sliced carrots), exactly the same way as before his operation. And he is thriving: he has already gained 20 kilograms. If he were not a test animal--if he did not have in his chest cavity two one-inch polyurethane tubes connecting the heart's membrane with the drive unit--then anybody would think that he was simply a healthy calf. He likes to have his head scratched where his horns are already emerging.

A doctor, an engineer, a nurse and two laboratory assistants monitor day and night the test animal's physiological functions and ensure that the experiment proceeds without complications. Professor Jaromir Vasku, MD, DrSc, chief of the Department of Pathological Physiology and coordinator of the research task, seems to revive on his way to the experimental room, to forget his fatigue from giving exams to medical students all day.

[Vasku:] Worldwide today the main and decisive criterion of an experiment's success is the number of days the test animal survives. This is a test of how the heart pump, and the drive and control unit function, and of how the organism adapts to nonliving tissue. It enables us to monitor, for example, the reactions in the peripheral organs, which is important for clarifying certain clinical states such as, for example, cardiogenic shock. Another part of the experiment--applied research--enables those who today are being trained on the experiments, to thoroughly prepare for similar operations on human patients in clinical practice later on. But let us return to our latest experiment, the most successful one to date. Worldwide all designers of artificial hearts still subscribe to the theory that polyurethane is the only suitable material for this purpose. Except for the polyurethane valves and membrane, our artifical heart is made entirely of polymethyl methacrylate, a material that is held to be strongly thrombogenic. I must confess that at first we did fear thrombus formation, but so far the clinial state of the animal, all the biochemical tests, and X rays of the chest with the artificial heart give no indication of thrombus formation. In other words, our Hasan is the only test animal in the world to have survived this long with a polymethyl methacrylate heart.

[Nadovicova:] The basis of successful implantation is precise surgery. In the professor's study I met the man who is the team's chief surgeon. We in Brno have seen him perform operations with Professor V. I. Shumakov of the Moscow Institute of Organ and Tissue Transplants, which belongs under the Ministry of Health USSR; or with Professor D. B. Olsen of Salt Lake City University in Utah. He is Jan Cerny, MD, assistant at the No II Surgery Clinic of the Medical School Hospital in Brno. This clinic has traditions of long standing in cardiovascular surgery. It is headed by Professor Vl. Koristek, MD, DrSc. Together with the Institute of Clinical and Experimental Medicine in Prague, it is best qualified to transfer the results of the experiments to no-less-demanding clinical practice.

[Cerny:] When Professor Vasku invited me to cooperate on the state research task, I gladly accepted his offer. This is a unique opportunity to actively participate in the most complicated experiments one can imagine. Moreover, there is hope that we clinicians will be able to work in the future with the temporary total replacement of the heart. Our experiments underwent a fairly complex development. We began with implanting the Soviet-made KEDR heart, continued with the TNS Brno I, and now we are implanting a perfected model, TNS Brno II. The important thing is that during this time we developed our own surgical procedures and have significantly shortened the length of time it takes to perform the surgery. In comparison with over 5 hours originally, we are now able to perform the operation in 3 hours, from the first incision to the last suture. The artificial heart begins to function after 120 minutes. This is a matter of experience, organization, and simply of the entire team's interplay, including not only the surgeons--Drs Z. Gregor, P. Wendsch, M. Dostal and T. Sladek--but other workers as well. Very important is cooperation with the anesthesiologist. Equally important is close cooperation between the surgeon and Engr V. Pavlicek who operates the heart-and-lung machine.

This cooperation is particularly important in that phase of the operation where we switch the test animal from the heart-and-lung machine to the artificial heart. Cooperation between the surgical team and the technical team under Engr P. Urbanek begins at this moment, and the technical team may work continuously for several months. So far as the operation itself is concerned, it consists of opening the right thoracic cavity to insert a canulla for hooking up the heart-and-lung machine. After startup of the heart-and-lung machine, the heart is arrested and extirpated, leaving only the trunk of the aorta and of the pulmonary artery, and a part of both atria. Which means that we remove both ventricles and all four heart valves. To the trunk of the aorta and of the pulmonary artery, and to the two atria we suture prosthetic tubes and artificial atria. These we then connect to the artificial heart that first must be carefully deaerated. We start to drive first the left half of the pump, and then the right half. Next comes a very important phase of the entire operation, a period of 3 to 8 minutes during which we gradually shut off the heart-and-lung machine and commensurately increase the heart pump's activity. Very often the outcome of the entire operation depends on the accurate interplay of the surgical team, of the heart-and-lung machine's operation, and of the technical team. And then we must not forget that postoperative care is no less complex.

[Nadovicova:] As soon as the animal completely adapts to the artificial heart, care must be exercised to ensure that the animal's newly acquired physiological regimen is accurately maintained. Therefore Professor Vasku, chief of the "artificial heart" project, holds a daily conference with the chiefs of the principal sections, to evaluate the situation during the past 24 hours, and to decide what must be done the next day.

Dr Cerny, which of the most serious heart diseases can now be treated surgically, and what are the prospects of utilizing the results of the experiment?

[Cerny:] Since the establishment of a separate Department of Cardiosurgery, most operations have been transferred here from the Nos I and II surgery clinics. We do about 350 heart operations a year. The most demanding of these are the replacement of two or more valves, the correction of congenital defects in children, for example, of Fallot's defect and of the transposition of the great vessels. Regarding your second question, perhaps I may say this much. First of all you must realize that replacement of the heart comes into consideration only when the heart muscles are so damaged that their function cannot be maintained even with the most intensive medication. I might say from experience that during heart surgery it sometimes happens that one or both ventricles fail and are no longer able to maintain the necessary blood pressure. Here we could use a supporting artifical heart, a modified half of the heart that we are using in our experiments.

[Vasku:] Of course, there will be also situations where we have a person suffering from serious heart disease, in a dyspneic and cyanotic state,

doomed to gradual death. And here we will have to make a decision. I think that implantation of an artificial heart would be in order, until a donor is found for a heart transplant.

[Nadovicova:] In other words, this is another opportunity for the artificial heart's temporary use. But is this in accord with medical ethics?

[Vasku:] Perhaps I have jumped the gun somewhat. Permission from the Ministry of Health would be necessary for such operations, and this permission will define the exact indications. But let us look at this from a different viewpoint. If 12 centers in the world are studying the partial or total replacement of the heart, and if we rank fifth in the world and even second in Europe, in terms of the number of days that the test animal survives, then I believe that this allows us to think about the future. After all, the purpose of our experiments is to aid suffering mankind.

[Nadovicova:] Don't you think that implantation in man will be more complicated?

[Vasku:] No, I and my colleague Cerny are convinced of the opposite. Certain anesthesiological problems and lung complications will be absent, and the implantation procedure will be more simple in view of the fact that the human thorax is smaller. We already have reports that abroad the implantation of an artificial heart into corpses has already begun, and from this we conclude that some research stations already are considering clinical implantation in the near future.

[Nadovicova:] What are the other pros and cons of an artificial heart?

[Vasku:] A pro is first of all the fact that an artificial heart of any size and with the necessary parameters can be ready on the operating table, for immediate use. And the cons? The materials used so far in designing cardiac prostheses cannot absolutely guarantee that thrombus formation will be excluded, and there is still the danger of embolism. Further complications may arise from the failure of some parts of the artificial heart.

[Nadovicova:] If an artificial heart is implanted in a person, will that confine him to a hospital bed?

[Vasku:] Not at all. We assume that in the future a person with an artificial heart will be able to lead a normal life, although at first his movements will be limited considerably. The problem is the drive, which must be miniaturized. In the United States there already exists a model of a hydraulic drive where the membrane's motion is ensured by the controlled fluid. This equipment will be implanted in the chest cavity, together with the artificial heart, and under the skin there will be only a lead to batteries worn on the body. For the time being, this system is still in the stage of laboratory tests, it has been implanted only into

a mockup of the human thorax, but it has not been tested experimentally. Of course, some authors of these projects do not intend to wait until this system is absolutely reliable and hence applicable to man. They are ready to use the experimentally proven pneumatic drive much earlier, even though the patient's range of mobility will be restricted considerably. In this first phase the patients will be persons waiting for subsequent heart transplants.

[Nadovicova:] Many problems have yet to be resolved. But we are living in in an era of revolutionary changes. Not so long ago, scientists in Czechoslovakia were still measuring the survival of test animals in terms of hours, days, and later in weeks. And now they already are measuring survival in terms of months. And all this within a surprisingly short time, using exclusively domestic materials and equipment, i.e., without dependence on foreign countries. Thus we can say with certainty that this is the start of an upsurge in cardiac research, one that will open new horizons for nonconventional clinical therapy and will confirm the soundness of the concepts advanced by the world's scientific-research centers. Among them the Brno KUNZ work station for the state research task "Support and Replacement of the Heart With an Artificial Heart," at the Department of Pathological Physiology of J. E. Purkyne University's School of Medicine, justiably ranks fifth.

1014
CSO: 2402

BRIEFS

MEDICAL RESEARCH--Upon recommendation of the permanent commission of CEMA for cooperation in health, Czechoslovakia has been following 12 areas of medical sciences. Blood circulation, malignant tumors, viruses, hygienic aspects of protection of vital environment, work hygiene and profession-induced illnesses are among those being researched. It also actively participates in cardiovascular and oncological research. Czechoslovakia also acts as the main coordination center for organ transplantation. [Prague LIDOVA DEMOKRACIE in Czech 12 Mar 80 p 3]

LASER MEDICINE--The Research Institute of Clinical and Experimental Oncology in Brno has been implementing laser technology in treatment of difficult-to-heal wounds. The laser beam penetrates about 1 millimeter of the wound tissue for a period lasting between 1 and 20 minutes. After a certain time the wound begins to fill up, a scab is formed and after removal of the scab, granulation of new tissue takes place. Success has been achieved in 80 percent of the cases involving 35 patients so far treated by this method. During the treatment patients have to fully cooperate with the physicians and maintain a strict hygiene. [Prague SVOBODNE SLOVO in Czech 14 Mar 80 p 4]

ASTRONOMERS AID MEDICINE--The Regional Public Observatory in Presov, Slovakia, is the coordination center for observation of the sun's photosphere. Its role within the framework of the Intercosmos program is the tracing of meteorites and interstellar matter. It will also participate in two international programs. Coordinator of the first program, which is observation of the solar types, is the Astronomic Institute at Skalnate Pleso. The second program has special importance this year, which is the year of solar maximum. Its task is to predict solar activities and preparation of forecasts, for the health-care services. Solar flares have high effect not only on health conditions of seriously ill persons, but also on successful completion of more serious surgical operations. The coordinator of the second program is the Astronomic Institute in Ondrejov. [Text] [Prague LIDOVA DEMOKRACIE in Czech 4 Mar 80 p 4]

CSO: 2402

PROBLEMS OF MICROELECTRONICS DEVELOPMENT, USE CITED

Leipzig LEIPZIGER VOLKSZEITUNG in German 14 Feb 80 p 8

[Article by Prof Dr Johannes Schmidt: "Microelectronics--Too Expensive for the GDR? Current Problems of Development, Production, and Application of Microelectronic Components"]

> [Text] Microelectronics affects processes, technologies and the products themselves. With the conversion of entire divisions and factories to the new technology, a totally new production organization is required. Concerning the accelerated development and comprehensive a,plication of microelectronics, it is for our country no longer a matter for subjective judgment as to whether we do or do not want it.

First and foremost, let it be established that microelectronics, as it relates to a thoroughgoing application in the economy of the GDR, is just at the beginning. With equal certainty, it could also be said that precisely in this lies important reserves for intensification. Nowhere are there experts who seriously doubt this fact.

However the significant, internationally verifiable cost reduction which can be achieved through microelectronics is, to be sure, disputed by no small number of our user operations and consumer-goods manufacturers. These colleagues point out, for example, that the use of microelectronic circuits and subsystems leads to a significant increase in costs. Their argument: The prices for microelectronic products are too high in the GDR.

It will not be contested here that in this connection there are price problems, thus, for example, in the basic production quantities established. These reasons, however, are not valid or, in fact, the main cause for possible cost increases. The true reason lies, rather, in the fact that users believe that microelectronics can simply be grafted onto conventional products, resulting in circuits and controls made up of presently available circuits and subsystems. This practice is, indeed, very expensive.

In this case the users simply do not recognize that the design of products and the latter's functional processes must correspond with the new, higher requirements of microelectronics. This alone is the basis for the cost reducing effect in these businesses.

The development, production and application of microelectronics is--to emphasize an additional important point--not associated with large technical and economical tasks exclusively. There is also a set of ideological questions to be clarified and a set of erroneous notions to be purged from people's minds. We should categorically oppose the idea that all progress in this area is to be accelerated primarily by importing "know-how" from capitalist industrialized countries. Rather, we must create or expand the foundations for the planned development, production and application of microelectornics under our own power in close cooperation with other socialist countries, especially with the scientists of the Soviet Union.

The advantages of microeletronics for the manufacturer of components are obvious. The material and energy expenditure decreases by a factor ranging from 1 to 30 percent compared to conventional electronics solutions based on semiconductor technology.

With transistors of the 1960's for example, the material required for one transistor function amounted to about 1 gram. In modern LSI circuits, the material required for one transistor function amounts to something on the order of a thousandth or millionth of a gram. The electrical-energy consumption function behaves similarly.

These rational technologies lead also to an increase in the productivity of labor. The work expended in the production of circuits decreases by an amount up to 10 percent per functional element; but in several cases, by less than 1 percent. These are important economic prerequisites which speak for the broad application of microelectronics in the component industry.

Also, significant benefits accrue for the users, say, in the equipment industry. Here, development time and costs are lowered primarily because microprocessors are freely programable and lend themselves to universal application. To list one example: In the replacement of the conventional core storage unit of the EC 1040 data processing installation by its successor model, the number of circuit boards is reduced by 75 percent. The use of solder decreases from 22 kg per core to 10 kg, and the copper requirement decreases from 220 kg to 60 kg. The total fabrication cost, just in the case of the equipment manufacturer, decreases by 76 percent. Finally, the high user utility expresses itself in higher functional complexity and greater product efficiency which leads to new use opportunities, decreased costs and manufacturing time and a reduced number of required workers and jobs.

It must, however, not be concealed that in the future the users must recognize even more clearly the value of microelectronics and its importance to overall economic development. The party resolutions clearly state in this regard that the equipment industry bears heavy responsibility for the development of new technological solutions based on microelectronics.

9160
CSO: 2302

HUNGARY

POLINSKY REVIEWS TRAINING OF TECHNICAL PERSONNEL

Budapest MUSZAKI ELET in Hungarian 8 Feb 80 p 3

[Article by Dr Karoly Polinszky, minister of education: "Concerning the Training of Technical Experts"]

[Text] The basis of the existence and development of society is production, the creation of material goods. One factor of this is deliberate human activity, which is of ever greater importance in the economic life of our present time. It is made so by the effect on production of the scientific and technical revolution--the strengthening of the process whereby science becomes a direct force of production, the use of ever new production technologies, computer controlled lines of machines, production systems and semi-automated or completely automated devices. The process is given special significance by the change in the world economy, the transformation of our own internal economy therein, the increasing shortage of raw materials and energy everywhere and, as a function of all this, the changing development of supply and demand on the world market.

The extent to which our economy will be able to resist the shocks of world market and world economic changes, which are difficult to plan in advance, depends on the flexability, intensity and quality of our production. Even if it cannot give complete immunity to the changes still the more prepared an economy is the less affected it is by shocks or surprises, or rather, the more quickly it can react and adapt to the changed situation. Meeting this requirement is a vital question and it depends--among other things--on the size and quality of the skilled labor force, on the level of training and on the ratio of the various levels. Training experts and preparing them to fit into the social division of labor is the task of the educational system.

Our educational system has tried to carry out this task for the past 35 years, in accordance with current requirements; it has achieved results of historic significance as a whole and while it has not been without errors it has tried successfully to satisfy simultaneously the economic policy demands (for a skilled labor force), the social policy demands (for social mobility) and the cultural policy demands (for the development of the socialist personality). Because of the changed circumstances described above let us examine only one of the above cited demands--although the goals cannot be separated from one another rigidly--the training of experts, more precisely the training of technical experts.

The present system of our technical expert training is well known and I mention the following only as a reminder.

The Training of Skilled Workers, Technicians and Engineers

Since 1969 we have taught 181 of the 201 skilled worker categories nationally recorded in middle level skilled worker training schools; 56 of these are also taught in trade secondary schools, and probably will be until 1982. It will be decided then on the basis of an evaluation of the experience to what extent we should change the ratio of parallel training or to what extent it should be discontinued. Since 1977 all the skilled worker training schools have had the same study plan for general subjects. This has made it possible for the young graduate skilled workers to take the secondary school completion examination--in the evening and correspondence branches of the 3 year trade secondary schools for skilled workers--and this makes it possible for them to win the title of technician or to continue their studies at a higher level.

The trade secondary schools offer training in 76 categories; 56 of these are the above-mentioned categories taught in parallel while 20 of the so-called theoretical type specialities are taught only in this type of school. In those industrial and agricultural fields where the technical level or the technology presently used does not yet justify the training of skilled workers at the secondary school graduate level, where the basic expert need can be satisfied by the skilled worker training school (for example, in the construction industry and light industry), the trade secondary schools train middle level experts.

Beginning in 1972 the training of technicians was abolished entirely in the school system--on the basis of a regulation issued in 1965. The interested ministries and authorities have regulated separately the system of technicans training and testing on the basis of guiding principles from the National Educational Council. The bulk of the experience acquired since the new system of technician qualification began in 1974 proves the correct direction of the decision. It is true, however, that the practice which has actually developed has not been able to ensure the replacement of technicians to the degree expected--neither in regard to quality or quantity. Further measures are needed in this area.

For more than a decade now engineer training has been taking place in two stages--factory engineer training in technical colleges, and to a lesser extent in universities, and graduate engineer training exclusively in universities. Higher technical education--the student ratio of which is more than 4 times what it was before the liberation, 37.5 percent--also conducts scientific research and development activity and is directly linked to the producing branches of the national economy. The two-stage graduate training is supplemented by post-graduate special engineer training which lasts 1.5 to 2.5 years (evening or correspondence).

New Requirements

If we compare the trends in the development of the economy which were outlined in the introduction (world economic changes, the transformation of the product structure of the domestic economy and the shortage of raw materials and energy) and the requirements which can be deduced therefrom with the present performance or results of the educational system in training technical experts then we see the need for and the trends of a development of the system of our technical expert training.

An economy which can flexibly adapt to world economic changes requires from the educational system a skilled labor force which can be regrouped from time to time in accordance with current needs--within certain trade groups or professional tracks--without any considerable loss to the individual or to the community. Thus our educational system has the task of increasing the general culture of the students and of teaching convertible information, broader and more deeply based, in a more integrated profile of trades because over the long run the skilled labor force will determine the economic potential of the national economy.

There are frequently contradictory interests between the forecast expert needs of society, the educational possibilities and the individual aspirations of those desiring to master information. Because of the many uncertainty factors--primarily the changing economy--the measurements pertaining to the skilled labor force and the internal distribution of the trade structure are not sufficiently precise or reliable and as a result it is very difficult to plan the needs too. The system of technical expert training is too rigid also; it cannot adapt quickly enough to changing economic and social needs. This also contributes to the fact--primarily in middle and higher level training--that sometimes there is the simultaneous appearance of the problem caused by an expert training which deviates from the quantitative and qualitative requirements. In this question we are only at the beginning of the desired change and modernization in the entire vertical structure of technical expert training.

Contradictory Interests

It is also a rather serious contradiction that the factories and enterprises--because of social interests not recognized or not taken congnizance of--desire from the educational system experts who have narrowly specialized special information and the corresponding practical preparedness although it has been well known for a long time that the educational system is not capable of this, or is capable of it only in a few areas, nor would it be useful to make it capable of this.

The road for the future in expert training is a rational division of labor between training institutions on the one hand and factories and enterprises on the other in such a way that the training institutions will continue to provide theoretical and practical basic training while specialization or preparation for a concrete job will be the task of the employer. The development

of this division of labor is especially essential in basic level training, in the training of skilled workers. In higher technical education we should strive to work out structures which will make possible a more flexible following of economic needs and more consistent internal career guidance based on the higher requirements. In addition we must increasingly spread that post-graduate training which satisfies the need for specialization.

It is also worthy of note that, discounting post-graduate training, the further training of technical experts is not sufficiently systematic or organized and lags at every level. An institutional solution is the common interest and obligation of both training sites and employers. Within this framework we must also further develop the system of technician training. The training as technicians of experts with basic level professional training and of skilled workers with secondary school diplomas must be solved in the adult education classes organized in trade secondary schools and connected to the trade secondary schools. The employers should further develop the further training of higher level technical experts and should prepare to organize further training which represents an integration of various degrees and higher qualifications.

One source of tension--because they place their own interests in the foreground--is that some of the enterprises and factories are reluctant to sign cooperation contracts with the trade secondary schools as prescribed by the Council of Ministers. Those interested in employing and using the skilled labor force are not happy to undertake the cooperation to create the conditions for modern practical trade education. But without this the modern information cannot be mastered. Interdependent with this is the fact that little progress is being made in either the vocational training schools or the secondary trade schools in regard to the supply of materials, preventive maintenance for machines in the classrooms or their timely replacement. This will require the united effort and cooperation of the guiding councils, the institutions and the interested enterprises.

In regard to educational methods our technical expert training--especially in higher education--sometimes preserves more than would be desirable those procedures which can be regarded as traditional. We are significantly backward by international standards in the use of professional-operational (production) exercises. To solve this problem we should not take the path of a quantitative increase in excercises but rather we should develop cooperation between training institutions and places of work which will provide significant production experience, together with high level theoretical training, for our future technical experts at both the graduate and post-graduate level by appropriately changing both production and theoretical activity.

Despite the problems which have been noted the trends of development give cause for confidence. It is possible for us to progress in the training of technical experts in harmony with the interests of the national economy and in accordance with the needs of the future.

8984
CSO: 2502

FIRST HUNGARIAN NUCLEAR REACTOR TO BE REBUILT

Budapest NEPSZABADSAG in Hungarian 9 Feb 80 p 5

[Article by Gabor Pal Peto: "The Oldest Hungarian Nuclear Reactor to Be Reborn"]

[Text] Reconstruction Plan Have Been Completed

It seems as if construction in Paks of the first Hungarian nuclear power plant reactor to be built would cast a shadow in the public's eye on the nuclear reactor which for decades has been providing great assistance to Hungarian health care, industry and to the most diverse areas of scientific and technical research. We are referring to the research reactor operating in Csillebere in the Central Physics Research Institute (KFKI) of the Hungarian Academy of Sciences [MTA], which has now entered the third decade of its activity and at the same time also at the doorstep of old age in its present form.

Academician Lenard Pal, chief director of the KFKI at the time, told our reporter in 1974: "I declare, in full knowledge of my responsibilities, that unless reconstruction is implemented very soon and at a very rapid rate, the research reactor will have to be shut down for technical and operational safety reasons" (NEPSZABADSAG 6 July 1974). Ferenc Szabo, KFKI's present chief director fully agrees with this, only he also adds that in 5 years the reactor has become even older. But these years have not wasted. Plans have been prepared for the reactor's reconstruction.

But let us first take a look at the past and present of the Csillebere reactor.

It Serves and Also Produces

This reactor which is not an energy producer but was built as a research reactor with the aid of Soviet experts and from parts supplied by the Soviet Union and began operation in 1959. However, these two decades have meant much use and also produced great advances in reactor construction.

The Csillebérc research reactor which at the same time is both a service and also a production equipment it is operated by the KFKI and by the Hungarian Academy of Sciences, but this reactor belongs to the entire country.

A portion of the radioactive isotopes were and are being produced in this reactor. In 1975 as much as 60 million forints' worth of radioactive isotopes were produced in Hungary in Csillebérc. It is expected that domestic isotope consumption will reach 100 million forints in a few years, and within this the rate of domestic production's growth will rise even faster. We now export isotopes in the value of 12 million forints per year.

Almost 500 institutions and enterprises use radioactive isotopes in Hungary, about one-third of this serves health care purposes, and more than 100 enterprises and institutions use the isotopes in their production activities. The balance is used by research and development institutions. About 70 to 80 percent of the domestic isotope output is medical preparations which are used in diagnosing and treating ailments.

If the reactor were to become unable to supply this need and our isotope requirements would have to be fulfilled from foreign imports, costs would double if for no other reason than because radiation protection from short half-life requires great circumspection and in addition--exactly because of their rapid decomposition--they have to be transported by airplanes which increases their costs many times.

In addition to KFKI's researchers the reactor was used in the last 20 years by about 20 other institutions and enterprises. Without trying to give a complete list, we will mention a few of the more important applications.

The reactor produces neutrons--electronically neutral particles which have no charge. These are used for research into material structures. Solid body research is one of the nationally emphasized main research directions. Useful results have also been achieved with the reactor in studying the structure of the nucleus. Sensitive analytical methods have been worked out with the use of neutrons and these for example, are made available as regular services in the domestic manufacture of semiconductors and to check product quality. It is also used for determining the purity of high quality and special metals. Methods have been worked out using it to analyze the nuclear reactor's cooling water, which will have great importance in Paks. Analyses have been performed for many institutes and institutions which could not have been done anywhere else in the country.

The Csillebérc reactor was and is also being used for biological research: results have been achieved in working out radiation protecting chemicals and in treating the mechanism of acute radiation injuries. The problems of accidental dosimetry (measuring radiation dosages) were also studied with the aid of this reactor, and this is also where the accidental dosage meters are calibrated and certified.

In spite of its limited capacity our first reactor has also proved suitable for technological research in nuclear energetics. These studies also provided valuable practical experience for the domestic nuclear energetics activity.

All this is not little in spite of being far from the full list of services provided by the reactor.

What Will Remain and What Will Be New

On appointment by the Academy's general secretary the KFKI and the Eroterv Enterprise [Designing Enterprise for Electric Power Plants] aided by the Kurchatov Nuclear Energy Institute of the Soviet Union--worked out seven alternatives for the reactor's reconstruction. From these then in turn the one was developed which the experts consider best, which they suggest be implemented. This proposal has already been accepted by the government's Science Policy Committee, thus it now stands before the final decision--that of weighing budgetary considerations.

Aided by this alternative of the reconstruction the Csilleberc reactor's capacity will increase from 5 megawatts to 20 megawatts. With this the reactor will regain its position in the center of international arena, where it was when it was built. However, without reconstruction it would have to be finally shut down in a few years according to the unanimous opinion of experts.

What will be rejuvenated on the Csilleberc research reactor?

First of all: the costliest parts will be saved, such as the present building, reactor block, primary circuit machine room, hot chamber series [sic] and many other things, and only the elements important from the operational reliability viewpoint will be replaced.

They wish to thoroughly modernize the reactor chamber, the primary circuit machinery equipment, the control system and the electrical energy supply. Thus it can be achieved that the new equipment elements meet the current safety and nuclear quality requirements. In the opposite case a situation could develop that the reactor would have to be shut down in the interest of future safe protection of the environment.

The dimensions of the new equipment will be different, thus the opportunity will open up to use the new, modern Soviet fuel elements and exploit the opportunities afforded by them.

Of course such a reconstruction is not inexpensive: its cost--depending on from where (capitalist or socialist countries) we succeed in obtaining the individual pieces of equipment--will be more or less, but at any rate around 500 million forints. Of this the cost of construction is only 10 percent. The Soviet Union will furnish the necessary nuclear materials, the fuel elements and beryllium metal for reflecting the radiation.

Among the reconstruction alternatives which have been worked out the experts have chosen the one which can be applied the most flexibly, the so-called twin-zone solution. The essence of this is that the active zone located in the beryllium block is divided into two sub-zones: one of these serves to produce isotopes, and the other supplies the horizontal, that is, research channels. Thus the neutron quantities used in the various subzones can be regulated independently, and so the demands can be satisfied with the least fuel consumption. But it is also worth mentioning that in this new construction the horizontal channels tangentially join the reactor's active zone--in contrast with the present axle direction joining--, and thus a neutron stream of such composition can be produced which has significant advantages in among other things material research.

As far as environmental protection is concerned the radioactive material content of the air leaving at the top of the reactor's 80 meter high chimney--but due to the high speed of the air stream actually dispersing at the height of 100 meters--is currently so small that even with the reconstructed, increased capacity of the operating reactor will only be a fraction of what is permitted by the international specifications.

The reconstruction will improve waste water disposal and storage of the exhausted but still radioactive fuel elements: it will increase capacity and safety.

The rebuilt reactor will be operated by the same number of people as before as the degree of automation is high even now and an R-10 computer made in Hungary also participates in the control.

Everything On a Higher Level

Modernization of the reactor will make it possible to not only continue all present research and services on a higher level but also to solve a whole series of new problems. We will mention only a few of these here--based on information received from the experts--, even more so because the rebuilt reactor will operate until the turn of the millenium and who could say with today's rate of scientific progress, what new research directions and applications will be born by then?

At any rate it can be expected that the results born by basic research will find practical applications.

Activation analysis as a service will have greater sensitivity and will be available in broader circles. The rebuilt reactor will also provide new opportunities for nuclear energetics research: for example, it will become possible to study the structural materials of the nuclear power plant because in this reactor it will be possible to simulate in a matter of a few weeks, what the extent of radiation exposure in the power plant will be. The corrosion and water chemistry processes, heat transfer conditions taking place

in the power plant reactor will be able to be studied. It will also open up new opportunities in isotope production. Isotopes with short and ultra-short lives [halflives] (a few hours, even a few minutes) can be produced here, and the importance of these is already increasing in medical-biological research and applications.

If the reconstruction is ultimately approved, the reactor will be shut down in July 1983 and disassembly will begin. The rebuilt reactor will be placed in operation in September 1985.

8584
CSO: 2502

METALLURGICAL INDUSTRY'S PROBLEMS WITH COMPUTERS

Budapest SZAMITASTECHNIKA in Hungarian Jan 80 p 8

[Report on roundtable discussion: "On Computer Problems in Our Siderurgical Enterprises"]

[Text] In a roundtable discussion on the occasion of the Dunaujvaros Technical Days the computer technology managers of the metallurgical enterprises discussed the results achieved in computer technology, and brought up its problems, its developmental tendencies, its anticipated capabilities and its tasks in economics and in organizational techniques. Participating in the discussion were Dr Laszlo Mudra, a department head from the Dunaujvarosi Vasmu [Dunaujvaros Iron Works]; Lajos Koka, a department manager for the Ozdi Kohaszati Uzemek [Ozd Metallurgical Plants]; Laszlo Karpati, a manager representing the Csepel Vas- es Femmuvek [Iron and Steel Works of Csepel] ISZI [Industrial Computer Technology Institute]; Istvan Balazs, a computer technology chief from the Lenin Kohaszati Muvek [Lenin Metallurgical Works]; Jozsef Varadi, section head from the KG [Koho es Gepipar-Metallurgical and Madrine Industry] ISZSZI [Institute of Industrial Management, Organization and Computer Technology], representing the KGM [Ministry of Metallurgical and Machine Industries] basic institute; and Ferenc Gemes from the faculty of the NME [Nehez Ipari Muzsaki Egyetem-Technical University of Heavy Industry] Foundry and Metallurgical Industry Institute. (Editor's note.)

From the standpoint of elaboration and implementation, the development of the administrative, productive, economic and directive processes of metallurgical enterprises on an electronic database is of very broad proportions. Naturally, in accord with the economic situation of the enterprises, this development is not uniform in its extent. At present there are differences in the capacity of computer hardware, in the area of tasks which can be solved, in the availability of a staff of experts and their training, and

in the investment capabilities dependent on anticipated computer technology. Observations have shown that the metallurgical enterprises have struggled with very many problems since computer technology entered enterprise economic life, and since the fundamentals for using the computers have become indispensable. This includes the basic development of hardware and software, the education of computer technicians, local computer maintenance, assurance of a supply of spare parts (operating matters), and the development of solutions on levels varying from one-time data processing to integrated management systems. However, we cannot be satisfied with the rate of development. Economic and managerial conditions and the increased demands more and more require more consistent and comprehensive development in enterprise organizational work than in the past and, to control this, the most completely integrated application of computer technology, that is, the greatest possible exploitation of computer technology in the metallurgical branch of industry. On the basis of past experience, Lajos Koka stated that exploitation of computer possibilities has been largely delayed up to now because of the enterprise administrative system, the systematic schedule of enterprise work and the lack of basic organization. He indicated that at one time one of the most important goals of development was the development of a uniform concept to provide directive functions on several enterprise levels in the area of both operation and process control. The formation of a computer network to provide this service is considered necessary.

In 1979 the Ozd Metallurgical Plants concluded a 130 million forint investment, with which they procured the computer technology fundamentals. They installed two R-22 computer systems and one R-10 basic, 16-position VIDEOPLEX-3 data storage. The systems developed are used primarily to modernize production-guiding systems.

Long-term hardware development is modest. It includes the relocation of the VIDEOPLEX working stations, direct connections between the R-10 and the R-22's, and assurance of the possibility of a maximum of 32 remote lines being connected to the two R-22 multiplex channels. The possibilities outlined in the sixth 5-year plan determine the direction of software development tasks. In the organizational work proceeding since 1974, the OKU [Ozd Metallurgical Works] have been cooperating with the NOTO OSZV with the faculty of the Dunaujvaros Institute of the Heavy Industry Technical University, and with KG ISZSZI.

Dr Laszlo Mudra stated that the Dunaujvaros Iron Works intend to resolve the developmental tasks in 10 years. The managerial council has decided which steps and which conceptual base the developmental plan should follow to the end. They have allotted 800 million forints for expenses. They have designated the continuous implementation of an integrated enterprise-directing system as their goal. The basis for this is a general idea which limits how many process-directing systems involve the enterprise, and how many management systems, subsystems and partial systems must be developed. The hardware background for this task is a

three-level computer network consisting of a center with two large machines (R-35 and R-40), 11 auxiliary centers with 20 small machines, and 220 data stations with 250 terminals.

In his report Istvan Balazs stated that, on the basis of the Lenin Metallurgical Works' results so far, other developmental possibilities are more modest than those of the other metallurgical enterprises. The preliminary conditions were also quite difficult and a BULL-G.115 machine, which is still functioning today, helped introduce computer technology into the profession. In 1979 an R-22 computer was installed. The positioning of the machine in the plant and the production of an individual technical staff created very great problems because of the circumstances of acquiring machinery. It was not easy to develop environmental conditions, to educate computer technology specialists and to guarantee an adequate staff. For example, the fact that an investment accounting system, developed (3 years) earlier by an outside institution, could not be implemented on this machine because of a lack of compatibility, created a problem. They want to use the R-22 primarily to aid in production-guiding tasks. The prospective possibilities of developing hardware are scanty and in practice they plan to increase the staffs (systems analysts, programmers, technical assistants) needed for two and three shift operation. The detailed plan for computer use has been set down in the study called "The position of the computer in the Lenin Metallurgical Works."

In connection with the above Laszlo Karpati reported on the results achieved in computer technology in the Csepel Works, its long-term plans, and the difficulties in applying computer technology. The reports demonstrated that the Csepel VSM [Iron and Steel Works] has achieved significant results in using computer technology. This was the first of the metallurgical enterprises to use computers. In the beginning they executed one-time data processing work (with an ELLIOTT 4130), then in 1973 they expanded this machinery with a SYSTEM 4/52 to meet constantly increasing tasks, and in 1979 they installed two R-22's in the plant. With this machine the Csepel VFM would like to solve the computer technology problems of 14 enterprises. Among other plans are remote data processing, further decentralization of data storage, the development of intermediate machines and plant installation of 30 microcomputers to develop payroll accounting. On the basis of this machine configuration they hope to elaborate manufacturing preliminaries, management systems and certain standard systems.

It became obvious during the discussion that the KGM metallurgical enterprises, except for a few minor deviations, must struggle with very similar and commonly occurring difficulties in using computer technology and in implementing further developmental plans. Some of these can be mentioned below, but not in the order of importance.

There is the question of operation of the already existing machine capacity. In this area the problem stems from the fact that the metallurgical enterprises, adjusted to ESZR [Uniform Computer Technology System] programs, have expanded this already existing machinery almost exclusively with ESZR machines (R-10, R-20, R-22, R-40) in the past. However, NOTO-OSZV, which has the primary task of assuring maintenance and spare parts supplies for these machines, is unfortunately not at the top of the profession. Almost every one of the enterprises complains that aid requested arrives late in each individual case, and that the spare parts deliveries are constantly late or more expensive, even though the enterprises try to acquire them by other routes. Referring to various causes, OSZV does not even offer aid when cooperation is needed at an R-22 location. Therefore LKM [Lenin Metallurgical Works of Diosgyor] took advantage of assistance from VEGYTERV in the Borsod megye for planning an air-conditioned machine room. It would be desirable to discuss this problem on a competent forum, since the enterprises mentioned have established their own technical maintenance staffs at the cost of a large investment in power, but would like in the future to cooperate with NOTO-OSZV and utilize its aid in certain cases.

To a greater or lesser degree every enterprise is struggling with the problem of experts. They are managing to catch up with the constantly growing tasks at a realtively slow pace. Resolving these matters means manifold tasks. On the one hand this includes the education of specialists entering this branch of industry and on the other hand their use in a proper staff. Even those enterprises which feel that they have enough experts utilize the aid of other branches or institutes to solve their organizational and programming tasks. Some are missing the organization of standard systems and standard computers, and the use of general programming packages. In some cases expedient use of computer technology is hampered by the fact that the basic organization has not been resolved in the enterprises, and therefore the development of an integrated enterprise-directing system can only be a long-term goal. One of the important questions, brought up even by Csepel VFM which is best off in this area, is the fact that cooperation between the branch computer technology institutes and the metallurgical enterprises is not adequate and, what is even sadder, the systems worked out by the computer technology institute are difficult to make available to enterprises. In his comments Ferenc Gemes supported what has been said, and one problem according to him is that the system organizers cannot establish suitable contact with the enterprise specialists, and another observation was that contact with fellow workers is not adjusted to the computer technology institutes. This particularly refers to organizers and programmers.

Worthy of attention from the standpoint of the uniform attitude and development of the entire industrial branch is the fact that the material resources of the metallurgical enterprises differ very greatly from one of another. (For example, the DVM [Dunaujvaros Iron Works] can allot 800

million forints for development, the LKM has a minimal investment possibility available except for a joint computer steel mill production control, and the current Csepel VFM conditions are adequate, but the KG ISZSZI has scarcely 10 million forints at its disposal for development.) As a result their developmental opportunities and plans are and will be on different levels. Many of the managers realize that development requires the formation of an integrated enterprise directive system, but this necessitates adequate material conditions.

In conjunction with what had been said, Laszlo Varadi very well summarized the problems, the tasks and the paths leading to their implementation. He stated that each enterprise should follow its own path in connection with development. Every enterprise has considerable mental power at its disposal for further development. The KGM is attempting to bring its mental power together and, in accord with every integrated concept, is trying to direct the steps of further development in a uniform direction by concentrating its material and mental resources.

One of the instruments he mentioned for this purpose is the KO VIR [Metallurgical Enterprise Information System], and since the specialists of the KGM basic institutes (KG ISZSZI) have little experience in the metallurgical industry, he considers increased cooperation and the joint use of acquired experience expedient. By and large the metallurgical enterprises have a uniform hardware base in keeping with the ESZR program announced by the KGM. This tangibly facilitates the development of uniform program packages or the use of already existing ones and their adaptation to the enterprises of any branch of industry, and would shorten to a considerable degree the processing time for identical work. It would also mean savings in manpower, since systems in the branch area would not have to be developed a number of times and there would be more beneficial use of machine time. To a certain extent the improved solutions would compensate for shortcomings resulting from different material circumstances and make it possible for this branch of industry to reach a higher level of computer technology than in the past. In conclusion we can state that there is a great deal of usefulness and, hopefully, success in a discussion where the computer technology specialists from a branch of industry can jointly weigh and consider the professional problems and together survey the questions affecting the entire branch. Perhaps such discussions could be more fruitful if, in addition to the computer technology experts, competent leaders from the metallurgical enterprises were to speak and could recount their experiences and improvements.

6686
CSO: 2502

ENZYME ENGINEERING IN THE STARCH INDUSTRY

Budapest KEMIAI KOZLEMENYEK in Hungarian Vol 52 No 3-4, 1979 pp 291-307
manuscript received 5 Aug 78

LASZLO, Elemer, candidate of chemical sciences, Department of Agricultural Chemical Technology, Budapest Technical University

[Abstract] This is a lecture delivered at the 13 June 1978 meeting of the Department of Chemical Sciences of the Hungarian Academy of Sciences, wherein the author has discussed the following subjects: 1) Enzyme isolation and affinity chromatography (the latter based on the catalytic specificity of the individual enzymes), 2) Production of modified enzymes for specific industrial technologies (the molecular causes of bond-cleavage probability, modification of the product spectrum [enzyme surgery], studies on the causes for a specific product configuration, water-donor groups and resynthesis), and application engineering of fixed enzymes, insofar as these subjects pertain to the starch industry. Enzyme engineering became the subject of studies only relatively recently, although enzymes have been used in industry for a long time. Enzyme engineering deals with the engineering remifications of the biosynthesis and fermentation of enzymes; isolation, purification, and examination of the properties of enzymes, application technologies of dissolved enzymes; preparation and evaluation of fixed enzymes; and research on the application technology of fixed enzymes. In order to utilize enzymes properly and productively, the catalyst (the enzyme) and the catalytic process must be studied on a molecular level. The paper quotes examples of such studies on the basis of references. Figures 12; references 20: 3 German, 11 Hungarian, 1 Japanese, and 5 Western.

2542
CSO: 2502 END

SELECTIVE LIST OF JPRS SERIAL REPORTS

EASTERN EUROPE SERIAL REPORTS

EAST EUROPE REPORT: Economic and Industrial Affairs
EAST EUROPE REPORT: Political, Sociological and Military Affairs
EAST EUROPE REPORT: Scientific Affairs

WORLDWIDE SERIAL REPORTS

WORLDWIDE REPORT: Environmental Quality
WORLDWIDE REPORT: Epidemiology
WORLDWIDE REPORT: Law of the Sea
WORLDWIDE REPORT: Nuclear Development and Proliferation
WORLDWIDE REPORT: Telecommunications Policy, Research and Development

END OF
FICHE
DATE FILMED

9 April 1980

D.D.